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Student Notes
Science on Saturday
Lawrence Livermore National Laboratory
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Enochs High School

Repairing DNA: Our Best Defense Against Cancer

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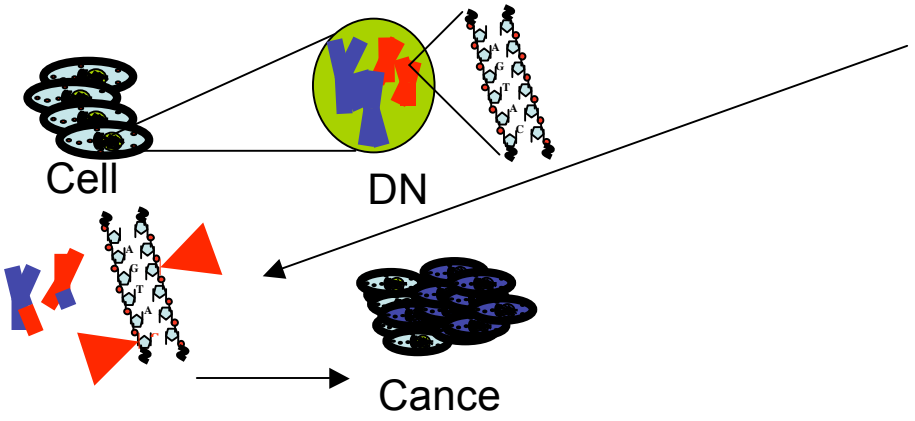
Goal: To understand the methods used at LLNL to assess the molecular nature of DNA and its role in Cancer.

You will be able to answer the following questions:
What is Cancer?
What is metastasis?
What is DNA and it's components?
What are genes? What do they make?
What are mutations?
What could cause mutations?
What is the relationship between tumor suppressors and onogenes?
How does DNA repair relate to cancer?

Add details to your *Student Notes* as you follow the talk.

Cells to Cancer:



What goes here?

Cell Parts:
What are the parts of a cell?

What do the following tissues do?

Muscle:

Lung:

Nerve:

Skin:

What do proteins do for a cell?

What are the parts of the DNA molecule?

The subunit of DNA is called: _____

A binds to _____ T binds to _____
C binds to _____ G binds to _____

How many chromosomes do human cells have?_____

What is the Chromosome that determines if you are male?_____

What is a gene?

What do genes give the cell the ability to do?

What are two types of mutations?
1.
2

What might happen if you have a change in a protein?

What are two general causes of mutations?
1.
2.
What might happen if a polymerase makes a mistake?

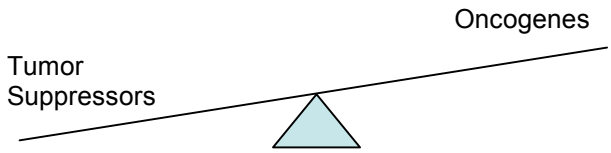
DNA repair is performed by groups of _____.

Mismatch repair corrects for _____ in the sequence of DNA.

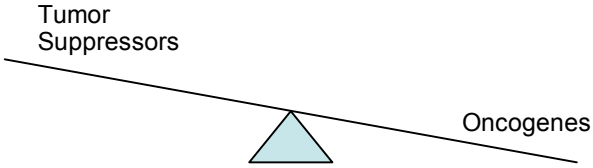
Excision repair works by _____ and _____damaged stretches of DNA.

What do tumor suppressor genes tell the cell?

What do Oncogenes tell the cell to do?



This leads to :_____



This leads to: _____

Define the following
Cancer:

Carcinos:

Oncos:

-ology:

How does UV light cause cancer?

What is the most common cancer is the U.S.?

What percentage of all cancer deaths are caused by tobacco?

What percentage of cancer deaths are related to diet and exercise?

What can you do to prevent cancer?

Valuable Cancer Websites

American Cancer Society: http://www.cancer.org National Cancer Institute: http://www.cancer.gov/ Surveillance Epidemiology and End Results (Statistics): http://seer.cancer.gov/	The Skin Cancer Foundation: http://www.skincancer.org/ Lung Cancer Foundation: http://www.lungcancer.org/ Harvard Center for Cancer Prevention: http://www.hsph.harvard.edu/cancer/

This lecture supports the California Content Standards for Grades 9-12.

Cell Biology

1. The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism's cells. As a basis for understanding this concept:

c. *Students know* how prokaryotic cells, eukaryotic cells (including those from plants and animals), and viruses differ in complexity and general structure.

d. Students know the central dogma of molecular biology outlines the flow of information from transcription of RNA in the nucleus to translation of proteins on ribosomes in the cytoplasm.

Genetics

4. Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism.

5. The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells. As a basis for understanding this concept:

a. Students know the general structures and functions of DNA, RNA and Protein

c. *Students know* how genetic engineering (biotechnology) is used to produce novel biomedical and agricultural products.

Investigation and Experimentation

1. Scientific progress is made by asking meaningful questions and conducting careful investigations.

John Hinz Ph.D.
Senior Biomedical Scientist

John Hinz: John received his Bachelor of Arts degree in Biology from Wabash College in 1995. He then went on to graduate school at the University of Utah, in Salt Lake City, and studied a cellular DNA repair mechanism called Mismatch repair, which plays a key role in the cellular avoidance of cancer-causing mutations arising during DNA replication. He received his Ph.D. from the department of Oncological Sciences in 2001. John has since been at the Lawrence Livermore National Labs researching the role of DNA repair in preventing mutations and cancer.

Additional information regarding this presentation is found on the Science on Saturday web site: http://education.llnl.gov/sos